

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) A method for improving the accuracy and repeatability of Electrochemical Capacitance Voltage (ECV) profiling comprising the steps of:

providing a sample, a sealing ring for a means of defining a measurement region on the sample, and providing an electrochemical cell to contain the electrolyte which is in contact with the sample during and ECV profiling-in-conventional manner;

monitoring the sample during an the electrolyte fill cycle to observe the presence of gas bubbles formed on the sample thereon;

monitoring the etched well for gas bubbles or surface films formed on the sample during ECV profiling;

measuring the area of the etched well area at the end of the ECV profiling-profile;

applying the ~~said measurements~~ measurement of the area of the etched well to the raw ECV profiling data to produce adjusted data more reproducibly representative of the ECV profile.

2. (Currently Amended) A method in accordance with claim 1 wherein a suitable an optical system is used which can be combined with the an ECV profiling apparatus for both monitoring to both monitor the etched well during filling and ECV profiling and measuring accurately measure the area of the etched well area once the profiling is complete, without removing the sample from the ECV profiling apparatus.

3. (Currently Amended) A method in accordance with claim 1 ~~or claim 2~~ wherein the steps of monitoring observation and measuring the area of measurement of the etched well comprise illuminating the sample with the use of a light source of above a band-gap energy of the sample, to illuminate the sample, and collecting the use of image collection means to collect a reflected light image from the sample and analyzing image analysis means to analyse the reflected light image from the sample to and obtain the said measurements measurement of the area of from the etched well.

4. (Currently Amended) A method in accordance with claim 3 wherein collecting a reflected light the image collection means comprises using a digital image collector imaging

means and/or a digitizer ~~incorporates means~~ to digitise the image for subsequent analyzing analysis by the image analyser.

5. (Currently Amended) A method in accordance with claim 3 ~~or claim 4~~ wherein the reflected light ~~image~~ is directed to be collected ~~towards the imaging means~~ by use of suitable ~~directing means such as a beam splitter~~.

6. (Currently Amended) A method in accordance with one of claim ~~claims~~ 3 ~~to 5~~ wherein the illuminating the sample and collected reflected light in the steps of monitoring and measuring the area of the etched well use a same light source and image collector, ~~imaging means are used to view and monitor the cell during the electrolyte fill cycle and the etched well area subsequently, in that the method comprises using the light source to generate a reflected light image of the cell during the electrolyte fill cycle and collecting the image via the imaging collector means, draining the electrochemical cell, taking the cell out of the optic path, using the light source to generate a reflected light image of the etched well area, and collecting the image via the imaging collector means to measure the said area of the etched well.~~

7. (Currently Amended) A method in accordance claim 1 ~~with any preceding claim~~ wherein the step of monitoring the sample during the electrolyte fill cycle comprises the step of obtaining a measurement of gas bubble formation on the sample thereon and using the measurement of gas bubble formation ~~this measurement~~ to provide automatic feedback for elimination of gas bubbles and/or to further adjust the raw ECV profiling data to produce data more reproducibly representative of the ECV profile.

8. (Currently Amended) An apparatus for improving the accuracy and repeatability of Electrochemical Capacitance Voltage (ECV) profiling comprises
an optical system ~~means~~ to monitor a sample during the electrolyte fill cycle to observe the presence of gas bubbles and surface films formed on the sample thereon,
an optical system ~~means~~ to monitor the etched well during ECV profiling,
an optical system ~~means~~ to obtain a measurement of the area of the etched well area at the end of the ECV profiling profile, whereby the ~~said measurements~~ measurement of the area

of the etched well is ~~may~~ applied to raw ECV profiling data to produce adjusted data more reproducibly representative of the ECV profile.

9. (Currently Amended) Apparatus in accordance with claim 8 wherein ~~the a suitable~~ optical system is ~~provided~~ to monitor the sample during the electrolyte fill cycle and the optical system to monitor the etched well during ECV profiling are the same optical system obtain the said measurements.

10. (Currently Amended) Apparatus in accordance with claim 9 wherein a single optical system is provided, the single optical system is adapted for use in combination with an the ECV profiling apparatus to both monitor the etched well during ECV profiling the measurement and to accurately measure the area of the etched well area at the end of the ECV profiling once the measurement is complete, without removing the sample from the ECV profiling apparatus.

11. (Currently Amended) Apparatus in accordance with claim 10 wherein the optical system means to monitor a sample during the electrolyte fill cycle, the optical system means to monitor the etched well during ECV profiling, and the optical system means to obtain a measurement of the area of the etched well comprises the a single optical system including a light source of above band-gap energy of the sample to illuminate the sample, image collector collection means to collect a reflected light image from the sample and image analyzer analysis means to analyse the reflected light image from the sample and obtain the said measurements measurement of the area of the etched well.

12. (Currently Amended) Apparatus in accordance with claim any one of claims 8 to 11 wherein the light source is a quartz halogen light source.

13. (Currently Amended) Apparatus in accordance with claim 11 any one of claims 8 to 12 wherein the image collector collection means comprises digital image collector imaging means and/or incorporates a digitizer to digitize means to digitise the image for subsequent analysis by the image analyser.

14. (Currently Amended) Apparatus in accordance with claim 13 wherein the digital image imaging collector means comprises a CCD camera.

15. (Currently Amended) Apparatus in accordance with claim 11 ~~any one of claims 8 to 14~~ wherein the image analyzer analysing means comprise a suitable computer programmed with suitable image analysis software.

16. (Currently Amended) Apparatus in accordance with claim 15 wherein the imaging collector means is interfaced to the computer to pass a digitized image thereto for processing the said ~~measurements~~ measurement of the area of the etched well and/or applying the ~~measurements~~ measurement of the area of the etched well to raw ECV profiling data ~~in the manner of the invention using suitable analysis software~~.

17. (Currently Amended) Apparatus in accordance with claim ~~15 or~~ 16 wherein the software is adapted to process the data from the image so as to extract the area of the etched well area and in the case of the sample being an anodized n-type GaAs substrate a blue film slice ~~the software is adapted~~ is able to differentiate between the wetted and illuminated areas, to ~~measure them~~ the wetted and illuminated areas, and determine the difference in the wetted and illuminated areas ~~excess area~~.

18. (Currently Amended) Apparatus in accordance with claim 16 ~~one of claims 15 to 17~~ wherein the image is processed using software to analyse the image and use the results of the analysis to provide automatic feedback for elimination of gas bubbles and surface films.

19. (Currently Amended) Apparatus in accordance with claim 11 ~~one of claims 8 to 18~~ further comprising a beam splitter to direct the reflected light image towards the imaging collector means.

20. (Currently Amended) Apparatus in accordance with claim 11 ~~one of claims 8 to 19~~ further being configured including means to receive an electrochemical cell in the optical path of the image collector imaging means during the electrolyte fill cycle and to remove the electrochemical cell, ~~which are adapted to enable the cell to be removed from the optical path after ECV profiling subsequently, so the same light source may be used to generate a reflected~~

light image of the etched well area collecting the image via the imaging means to measure the said area.

21. (Currently Amended) Apparatus in accordance with claim 11 ~~one of claims 8 to 20~~ further comprising a focusing system ~~focussing means~~ to compensate for the difference in focal length when a electrochemical cell window ~~the cell windows~~ and electrolyte are in the optical path.

22. (Currently Amended) Apparatus in accordance with claim 21 wherein the focusing system comprises a fixed focus element ~~imaging means is provided~~, and a removable lens in the optical light path of the image collector ~~to the imaging means is provided~~ to compensate for the difference in focal length.

23. (Currently Amended) Apparatus in accordance with claim 11 ~~one of claims 8 to 22~~ further comprising a focusing system ~~focussing means~~ to focus the reflected light image from reflective image ~~of the sample~~.

24. (Currently Amended) Apparatus in accordance with claim 23 wherein the focusing system comprises a comprising fixed focus element ~~imaging means~~, and wherein a mechanism is provided for moving the sample along the optical axis path to adjust the focus of the reflected light images ~~so that it focuses on the fixed focus imaging means~~.

25. (Currently Amended) Apparatus in accordance with claim 20 ~~one of claims 8 to 24~~ wherein the electrochemical cell is provided with a window for viewing and illuminating the sample, the window being which is preferably slightly angled to prevent reflection from the surfaces of the window being imaged on the image collector ~~degrading the reflected image on the imaging means~~.

26. (Currently Amended) Apparatus in accordance with claim 21 ~~one of claims 8 to 25~~ further comprising a flip lens before the image collector ~~imaging means~~ to correct for refraction by the electrolyte and the cell window when monitoring the sample during electrolyte fill cycle and monitoring the etched well during ECV profiling ~~for the apparatus is being used to view and/or monitor gas bubbles and surface films~~.